Rabies Vaccine Encephalomyelitis in Relation to the Incidence of Animal Rabies in Los Angeles

CHARLES F. PAIT, M.D., AND HAROLD E. PEARSON, M.D.

Contagious Disease Unit and the Pathology Service of the Los Angeles County Hospital; and the Bacteriology Department, University of Southern California School of Medicine, Los Angeles, Calif.

THE field of communicable diseases has no more harassing problem than that of rabies. In areas where the disease is endemic the management of persons bitten by animals is unsatisfactory. Any advantage gained from the use of vaccine must be balanced against the chance of resultant, postvaccinal encephalitis.

The following indications for vaccination against rabies in the human being have been suggested[5]: (a) the biting animal is clinically rabid; or (b) is proved rabid by laboratory tests; (c) is suspected of being rabid; (d) in an endemic area, a stray animal escapes after biting; (e) an individual has handled an animal diagnosed as rabid and fresh abrasions of skin have been contaminated with saliva.

The number of persons who develop rabies after the bite of a rabid dog is not known with certainty but on the average may be 5 to 15 per cent[8]; if vaccine is given, the number may be reduced by half.[8] Too often, however, the situation involves categories (c) and (d) above. In such instances it is particularly necessary to estimate the likelihood of severe vaccination reactions. Table 1, as modified from McKendrick's figures of 1940 collected from worldwide sources, shows the incidence of paralytic accidents.[9] Such accidents are attended by a fatality rate of 5 per cent for the dorsolumbar type and 30 per cent for the Landry type of reaction.

Most of the vaccine used in this country is the Semple type and few data are available on the actual number of paralytic accidents here after use of such material. McCoy[6] reported an incidence of 1:2,900 among 17,600 treated persons but since 4 of the 6 reactions were fatal this rate probably is too low. Horack[3] recorded a rate of 1:1,200, 10 per cent fatal, among 24,000 treated persons.

TABLE 1

Incidence of Paralytic Accidents after Rabies Vaccine (from McKendrick, 1940)

Attenuated virus (Pasteur)	1:3,000
Diluted virus (Hogyes-Harris)	1:3,000
Phenol treated virus (Semple)	1:9,000
Ether treated virus (Alivisatos)	1:10,000
Heat treated virus	1:18,000

Some observations made on the incidence of postvaccinal encephalomyelitis in relation to the prevalence of animal rabies in Los Angeles City and County are presented here; 4 of the 9 cases listed were included in a previous report.[7]

Rabies is endemic in Los Angeles. There were (1946) approximately 3.5 million people living in an area of 4,000 sq. mi. in the county and almost 2 million in the 450 sq. mi. of the city proper. During the period of 25 years prior to 1947, there were 3,190 persons in the

TABLE 2

Cases with Reactions to Rabies Vaccine

Age Yrs.	*Sex*	*Vaccine Inject.*	*Type of Contact*	*Onset Days after First Dose*	*Dog*	*Clinical Impression*	*Hospitalization Weeks*	*Condition on Discharge*
2	M	7	Face bite	9	Not rabid	Encephalomyelitis	6 (fatal)	No virus obtained from brain by injection into mice. No Negri bodies.
15*	M	13	Bites hip, elbow	12	Not found	Meningomyelitis	2	Recovered.
33	M	13	?	?	?	Myelitis	0	Physician's record not available.
17*	F	6 (2 ml.) 8 (1 ml.)	Bite	18	Rabid (cat)	Encephalomyelitis	1	Residual stiffness back.
12	F	14	Petted dog	11	Rabid	Myelitis	2	Recovered. Completed rabies vaccine treatment 4 yrs. before.
11	F	5 (2 ml.) 6 (1 ml.)	Nonpuncture bite	10	"	Meningoencephalitis	1	Slight diplopia.
40*	F	5	Bite	4	"	Encephalitis	3	Marked improvement. Poliomyelitis 11 years before.
25*	M	11 (2 ml.)	Bite, hand	10	"	Transverse myelitis	1	Moderate urinary retention. Ankle clonus.
24	F	5 (2 ml.) 6 (1 ml.)	Bite on leg	11	"	Meningoencephalitis	1	Recovered.

* Previously reported [7]

city bitten by dogs proved to be rabid, but 3,560 persons received rabies vaccine. Of 22 deaths from rabies 14 had no vaccine. In 20 years of this period there were 14 cases of human rabies in the county exclusive of the city.

In the city approximately 90 per cent of the dogs over 4 months of age are licensed. On the basis of 125,000 licenses issued in 1946 the city's dog population exclusive of puppies may be estimated to be 140,000. On the average, a laboratory diagnosis of rabies is made annually on 40 dogs. Thus, at least one dog in 3,500 in the city becomes rabid. Since there are an unknown number of rabid dogs either not brought to examination or not detected if examined, the actual incidence is almost certainly higher. Approximately 150 rabid dogs per year are found in the county outside the city but the total dog population in the county is unknown.

Some 10,000 animal bites per year are reported in the city; these are almost all by dogs. Approximately 70 persons per year are bitten by known rabid animals; thus, one bite in 140 is by a rabid animal. On the basis of a 10 to 15 per cent human fatality rate following the bite of a rabid animal [8] the chance of getting rabies from known animal bites in the city of Los Angeles is 1:1,400 to 1:2,100. This does not include the numerous unreported bites which must occur.

During the 7 year period of 1940–1946, 9 cases of severe postvaccinal reactions, including one death, occurred among 5,500 persons receiving vaccine in the city and county, an incidence of 1:600. Particulars concerning these cases are shown in Table 2. All received Semple vaccine. Although 4 were given the product of one manufacturer, there is no reason to believe on the basis of total use of this particular product that it is unusually encephalitogenic.

DISCUSSION

Even the remote probability of developing rabies from a dog bite indi-

cated by the rough approximation made here will not alter the necessity of employing vaccine for any person bitten by an unidentified dog. Certainly, however, many persons receive vaccine who do not require it.

On the basis of data presented here and elsewhere it is apparent that the incidence of rabies vaccine encephalitis is a real contraindication to its indiscriminate use. Without discussing the theories regarding the etiology of this condition, it is likely that the incidence will be reduced markedly when a product more completely purified of brain tissue is produced; most present vaccines consist of approximately 10 per cent suspensions of rabbit brains.

There is ample evidence that rabies can be controlled in the absence of any considerable wild animal reservoir by control of dogs. Various plans and programs for control are now under discussion.[1-4] It is certain that none will be effective unless accepted by the public. This aspect is complicated in the Los Angeles area by the presence of a large and highly vocal group of dog fanciers who tend to resist all efforts to interfere in any way with the dog population. While such persons may reject programs based on protection of human beings they can scarcely fail to accept one designed primarily for the protection of dogs.

SUMMARY

In Los Angeles City and County approximately 200 rabid dogs are detected annually. There is only one human case per year but at least 800 persons are given rabies vaccine. The chance of acquiring rabies from known dog bites in Los Angeles is estimated to vary from 1:1,400 to 1:2,100.

There were 9 cases, one fatal, of postvaccinal encephalomyelitis among 5,500 treated persons, an incidence of 1:600.

An adequate rabies control program acceptable to the public and directed at the canine population is highly desirable.

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